SPECIAL BULLETIN 65 FEBRUARY, 1914

MICHIGAN AGRICULTURAL COLLEGE EXPERIMENT STATION

DIVISION OF BACTERIOLOGY

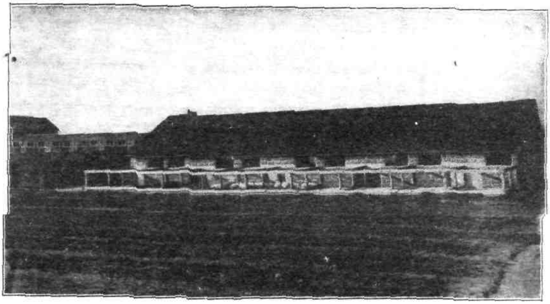

Figure 1. Stable for housing hogs used in serum production.

HOG CHOLERA AND PREVENTIVE TREATMENT

WARREN S. ROBBINS

EAST LANSING, MICHIGA!
1914

FOREWORD.

Some points relative to hog cholera have been quite definitely settled. That it is a serious menace to swine husbandry is not questioned by those communities that have been invaded by its ravages. It seems to be admitted the world over that its cause is an ultramicroscopic living germ, the nature of which is not thoroughly understood. Those interested in swine husbandry must not become impatient at the failure of science to furnish an answer to all the questions in this connection that should be answered. Many difficulties stand in the way of scientific efforts along this line. It is also generally accepted that the serum described herein is a preventative for hog cholera under favorable conditions. The proper use of the serum under all conditions is one of the problems yet to be solved. Mr. Robbins, who has direct charge of the manufacture of the serum in this laboratory, has set forth the views of this laboratory, concurred in by the officials of the State Live Stock Sanitary Commission with whom we are coöperating in an effort to control the ravages of this disease in Michigan.

We feel that we may confess in no apologetic sense that our ideas relative to the value and use of serum have undergone changes in the past and we expect that our views will be altered by future developments. This bulletin indicates the position taken at this time.

WARD GILTNER.

HOG CHOLERA AND PREVENTIVE TREATMENT.

BY WARREN S. ROBBINS.

INTRODUCTION.

Hog cholera is the most dreaded disease known to swine producers of today. This disease has existed for many years and has been prevalent in most countries where hogs are grown. The first outbreak in the *United States* was reported in Ohio in 1833.

Evidently, the spread of cholera was not great or did small damage

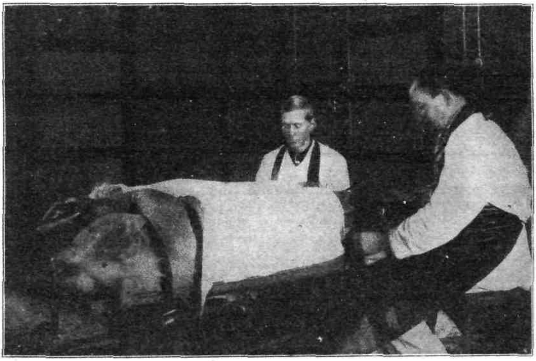

Figure 2. Bleeding serum hogs from the tail.

for sometime after the first outbreak as there was little effort put forth to control it until about 1880. At this time, Salmon and Smith of the Government Service announced that the cause of hog cholera was a microörganism called *Bacillus cholerae suis*. This statement was accepted by many workers, yet doubted by some.

In 1903, or about that time, de Schweinitz and Dorset, of the U. S. Bureau of Animal Industry conducted numerous filtration experiments and found that *Bacillus cholerae suis* would produce a disease similar to hog cholera in many respects, yet was non-contagious. Hogs immunized to *Bacillus cholerae suis* were found to be susceptible to the filterable virus. The filtrate secured by filtering virulent blood produced typical cases of cholera. These results were confirmed by many American and foreign investigators.

Soon after the discovery of this filterable virus causing hog cholera, Dorset, McBryde and Niles produced what is now known as Dorset-McBryde-Niles serum or hyperimmune serum, and put forth methods of producing serum, demonstrating them at Ames, Iowa in 1908. After this demonstration, the production of serum was undertaken by many agricultural experiment stations and numerous commercial laboratories.

CAUSE OF HOG CHOLERA.

The cause of hog cholera is known to us only as a filterable virus, or in other words it may be referred to as an organism so small that it will pass through the finest filters made and can not be grown under artificial conditions. In addition to this filterable virus, an accessory cause of cholera is anything that will lower the vitality of an animal. This would include insanitary conditions of pens and hog houses and poor feed. However, hogs become infected with cholera in some of the herds where there can be no criticism of the sanitary conditions, feed or care.

SUSCEPTIBILITY.

Some hogs are very resistant to cholera, even when poorly fed and under insanitary conditions, while others are more susceptible. Generally, young animals are more susceptible than old ones. However, young pigs from immune sows, as a rule, have more resistance to the disease than older hogs, not having been immunized, but this apparent immunity is of short duration and should not be depended upon to protect the pigs for any considerable time. Fat hogs in close pens will often contract cholera more readily than when running on pasture. A small percentage of hogs is either naturally immnue to cholera or will recover from the disease. All breeds of swine are about equally susceptible to cholera and there is no truth in the statement that the mule-foot or any other breed is naturally immune.

THE PERIOD OF INCUBATION AND COURSE OF THE DISEASE.

The period of incubation of cholera, or the time from exposure until symptoms develop, is from three to about fourteen days, depending on the natural resistance of the animals and the virulence of the virus, method of entrance and amount of virus introduced. We have two stages of cholera to combat: The acute and chronic types. Usually the disease in animals with low resistance is acute and in those with high resistance it takes the chronic form. The latter may cause animals to remain with low vitality for several weeks and finally die or recover, while the former usually causes death within fifteen days. In any outbreak of the disease we can usually find cases of both acute and chronic cholera. From the beginning of an outbreak, the disease will usually become more virulent with herds of young hogs and less virulent with the old hogs, this being due to the old hogs having more resistance than young hogs.

SYMPTOMS OF CHOLERA.

The most common symptoms of cholera are, weakness of limbs, loss of appetite, high fever, dullness and inflammation of the eyes, rough

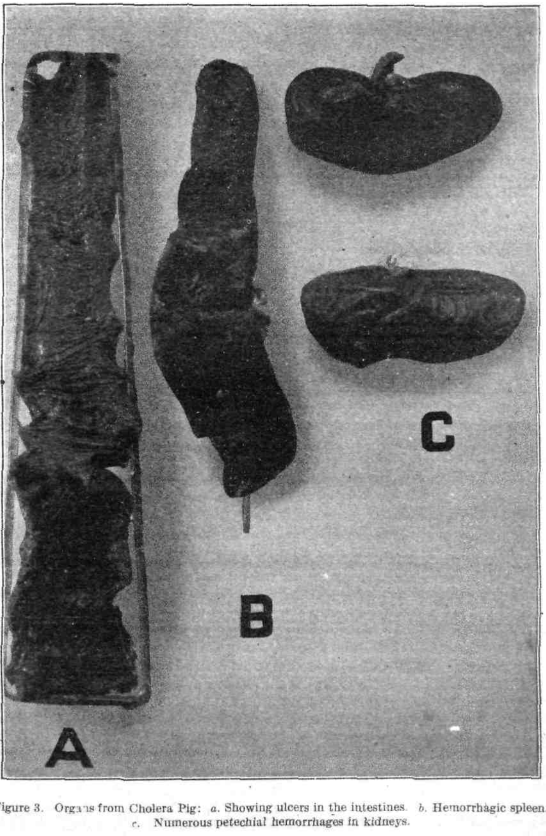

Figure 3. Organs from Cholera Pig: *a*. Showing ulcers in the intestines. *b*. Hemorrhagic spleen. *c*. Numerous petechial hemorrhages in kidneys.

coat, red or purple discoloration of the skin on the ears, belly, nose, and between the thighs. The animals are greatly depressed, become emaciated, have difficulty in breathing, and seek quiet places to lie down. They may be constipated or have diarrhoea, the feces are often of a very offensive odor and sometimes contain blood. When near death, the body becomes covered with a slippery, cold sweat. With chronic cholera these symptoms are not so pronounced and the animal may linger in an emaciated condition for several weeks. Some animals suffering from chronic cholera possess a very good appetite, but are unable to assimilate all of the food they eat. The symptoms of this disease are by no means constant and while typical cases may present the symptoms enumerated, a large percentage of the affected animals may show but few, if any of them.

POST MORTEM LESIONS.

On post mortem examinations, the lesions of cholera are found to vary greatly and very seldom will all lesions be found in any one case. In a large percentage of cases a positive diagnosis is impossible. The most characteristic changes to be looked for are as follows: Hemorrhages in the kidneys, varying in size from minute dots to the size of a pin head and in small or large numbers. The spleen may be slightly or very much enlarged and contain small hemorrhages, or it may be very dark and friable. The lymph glands are usually very much enlarged and of a red or bluish color. The intestines may show hemorrhagic spots under outer covering in the acute type of cholera and the mucous membrane of the caecum may be very much inflamed. Chronic cholera is usually distinguished by the presence of button-shaped ulcers in the caecum. The mucous membrane of the stomach may be inflamed. The lungs may contain hemorrhages or the bronchioles may be filled with pus and there may be adhesions of the pleura to the thoracic walls. These latter changes of the lungs are looked upon as complications of cholera and may exist with other diseases. In some cases the heart is found to contain small hemorrhages.

SPREAD OF CHOLERA AND PRECAUTIONS.

Hog cholera is a highly infectious disease and may be easily carried from place to place unless proper precautions are taken. The excreta from sick animals will produce the disease very readily and should not be scattered over any premises carelessly. If spread on the farm they should be plowed under immediately. Dogs, birds and any farm animal can carry the disease from infected premises to uninfected herds. Persons feeding or caring for sick animals may carry cholera on their clothing or shoes. No person should undertake to care for sick and healthy hogs at one time unless he thoroughly disinfects or changes clothing and shoes. Farmers should not permit stock buyers to get in their hog lots or in any way come in contact with their hogs as this may be the means of an outbreak of cholera. Most stock yards are at all times infected with hog cholera and no person should go among healthy hogs after having gone through the stock yards without first disinfecting his shoes. All hogs introduced to any premises should be kept in quarantine for at least

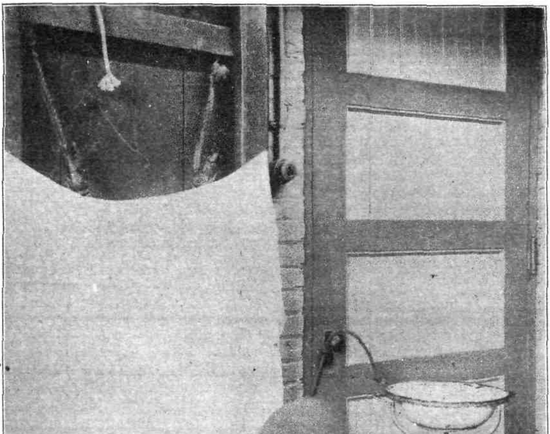

Figure 4. Bleeding Virus Pig from the throat to secure virus for hyperimmunization.

fifteen days previous to placing them with other hogs. These animals may come from healthy herds, yet become infected on the road in some manner. A boar being used for breeding other than the home herd should be kept in quarantine or away from the herd at all times during the breeding season and should be thoroughly sprayed or dipped after each service and before being placed back near the herd. Sows having been driven away to be bred should be kept in quarantine for two weeks before being placed back with the herd. Hogs from herds having been recently vaccinated by the simultaneous method of treatment (injected with serum and virus) should not be introduced among unvaccinated animals for sometime and should be thoroughly sprayed or dipped before introducing them into another herd at any time. In case of death of any of the herd, the carcasses should be cremated or buried deeply and by no means left on the top of the ground for dogs, cats and birds may carry the disease to many herds from one diseased carcass. When an animal dies in the herd an autopsy should be held as soon as possible after death by an experienced person or by a competent veterinarian to try to determine the cause. In making an early start in checking any disease, more progress is made towards controlling it. Streams of water are very often sources of cholera even when there is no infection in the immediate vicinity. Infected pens should not be drained into a stream. Stock cars being drawn over streams may inoculate the water with hog cholera. To prevent the spread of cholera every hog owner should take the most strict precautions known for his neighbors' benefit as well as for his own. It is in his interest to prevent the disease getting a start in the community, since the larger the infected territory, the harder it is to stamp out. It is the duty of every person owning or knowing of a hog sick with cholera to report it to the State Live Stock Sanitary Commission immediately.

Attention is here called to sections 6, 12 and 28 of the State Live Stock Sanitary laws:

"Sec. 6. It is hereby made the duty of all local boards of health, *to whom cases of contagious or infectious diseases are reported, to* immediately investigate the same, either in person by some member or members of the board, or by the employment of a competent and skilled veterinarian and should such investigation show a reasonable probability that a domestic animal is affected with a contagious or infectious disease of a malignant character, the local board of health shall immediately establish such temporary quarantine as may be necessary to prevent the spread of the disease, and report all action taken to the commission or to some member thereof; and the acts of local boards of health establishing temporary quarantine shall have the same force and effect as though established by the commission itself, until such time as the commission may take charge of the case or cases, and relieve the local board of health. All expenses incurred by local boards of health in carrying out the provisions of this act shall be paid in like manner as are other expenses incurred by said boards in the discharge of other official duties.

"Sec. 12. Any person who shall have in his possession any domestic animal affected with any contagious or infectious disease, knowing such animal to be so affected, or, after having received notice that such animal is so affected, who shall permit such animal to run

at large, or who shall keep such animal where other domestic animals not affected by or previously exposed to such disease may be exposed to its contagion or infection, or who shall sell, ship, drive, trade, or give away such diseased animal or animals which have been exposed to such contagion or infection, or who shall move or drive any domestic animal in violation of any direction, rule or regulation, or order establishing and regulating quarantine, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be fined in any sum not less than ten dollars nor more than one hundred dollars, or be imprisoned in the county jail not less than ten nor more than ninety days, or both such fine and imprisonment in the discretion of the court, for each of such diseased or exposed domestic animals which he shall permit to run at large, or keep, sell, ship, drive, trade or give away in violation of the provisions of this act.

"Sec. 28. In case of an outbreak of hog cholera the State live stock sanitary commission shall, upon application in writing of two or more swine owners in any locality, immediately investigate the conditions and surroundings and take such steps as in its opinion seems advisable to check the spread of the disease. All serum used shall be furnished by the State, and all expenses incurred in the administration of the serum for the prevention and spread of hog cholera shall be paid as other expenses that are incurred by the commission."

USE OF HOG CHOLERA SERUM.

Aside from sanitary precautions, quarantine regulations, and hygienic measures, hog cholera serum is the only aid we have for combating hog cholera. This agent has little or no curative powers and is only used as a preventive of cholera in healthy hogs.

PRODUCTION OF SERUM.

Hog cholera serum is the blood drawn from hogs having been first immunized (unless naturally immune) and then hyperimmunized to cholera virus. When an animal is naturally immune or immune from vaccination, the blood of that animal contains "antibodies" in such numbers as to protect the individual from the disease. By injecting large quantities of hog cholera virus (blood from sick hogs) into an immune hog the body cells are acted upon by the virus and stimulated so as to manufacture more "antibodies," which are thrown into the blood circulation of the hog so injected and it then possesses a high degree of immunity to cholera, i. e. is hyperimmune. Therefore, the blood drawn from a hyperimmune contains "antibodies" in such great numbers that when it is injected in small doses, into susceptible hogs, it will immunize them against the disease.

The first essential to be considered in manufacturing hog cholera serum is a good strain of virus. This may be secured by taking a sample of blood from an animal having the disease and, if weak, passing it consecutively through several small pigs by inoculation. It should attain such virulence that when injected into susceptible pigs in 2 cubic centimeter doses it will produce typical cholera symptoms in from four to seven days and produce death within fifteen days.

Next, we must have healthy, susceptible pigs, weighing from fifty to

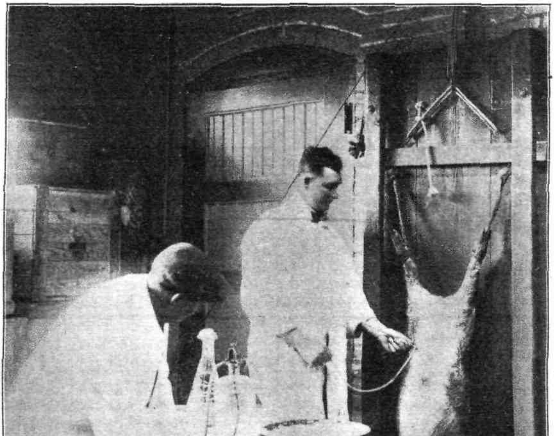

Figure 5. Injecting sterile .85% salt solution into Virus Pig intra-abdominally 6 hours before killing.

one hundred pounds each, for virus pigs. These are each inoculated with from 2 to 5 cubic centimeters of virus. They must have a very virulent form of the disease within fifteen days from date of inoculation. When in the height of the disease, they are killed. The blood is collected in sterile vessels and defibrinated by whipping with glass rods. This defibrinated blood is then ready to be used in hyperimmunizing. The average amount of blood secured from cholera pigs is about 10 cubic centimeters per pound of body weight. Thus, we would secure one liter (about one quart) of blood from a 100 pound pig. To utilize the virus pigs for virus other than for virus blood, they may be injected intra-abdominally with physiological salt solution five to six hours before killing and in amounts not exceeding 30 cubic centimeters per pound of body weight. That part of the solution remaining unabsorbed, after killing the animal, is removed, defibrinated and used in hyperimmunizing, the same as virus blood.

Hogs used for hyperimmunes usually weigh from one hundred to three hundred pounds. Unless naturally immune, they are actively *immunized by vaccination. In ten to fifteen days after this treatment* they are ready to be hyperimmunized.

In hyperimmunizing, the virus is injected by means of a sterile aspirator apparatus using one of the following methods:

Slow subcutaneous method.—By this method the virus is injected in gradually increasing doses, usually at intervals of one week, until a total of 8.5 to 10 cc. per pound of body weight has been injected.

Quick subcutaneous method.—By the quick subcutaneous method 10 cc. per pound of body weight is injected at one dose.

Intra-abdominal method.—By this method, 10 cc. of virus per pound of body weight is injected intra-abdominally in one dose.

Intra-venous method.—By this method virus is injected into the veins of the ears at the rate of 5 cc. to 7 cc. per pound of body weight, at one injection.

One week after hyperimmunization, these animals are bled by severing the arteries of the tail, the blood being drawn at the rate of five cubic centimeters per pound of body weight. These bleedings are repeated, at intervals of one week, until three have been made. After the third bleeding hyperimmunes may be re-hyperimmunized by injecting about one-half the dose required for hyperimmunizing. Three bleedings may then be carried out as before and so on until the tail is used up.

When the hyperimmunes can no longer be bled from the tail, they are slaughtered and all of their blood collected. The blood secured from all bleedings is defibrinated as soon as it is drawn, by whipping with a glass rod and is then preserved by adding 0.5% of carbolic acid. When the last bleedings from animals are secured, all bleedings from each hog are mixed and stored at a temperature of 5° to 10° Centigrade.

This serum is tested by simultaneous inoculation of virus and serum on susceptible pigs weighing from 50 to 100 pounds each and if found to be of high potency, is distributed to any one desiring to use it, at cost price.

METHODS OF TREATING HOGS WITH SERUM.

There are two methods of treating hogs with hog cholera serum as follows:

Serum-alone method.—By this method a regular dose of serum is injected with a hypodermic syringe intra-muscularly.

Simultaneous method.—By this method, in addition to a regular dose of serum a small dose of virus is injected.

With the serum-alone method, only a short period of immunity is conferred, because the serum injected will not aid the body cells in

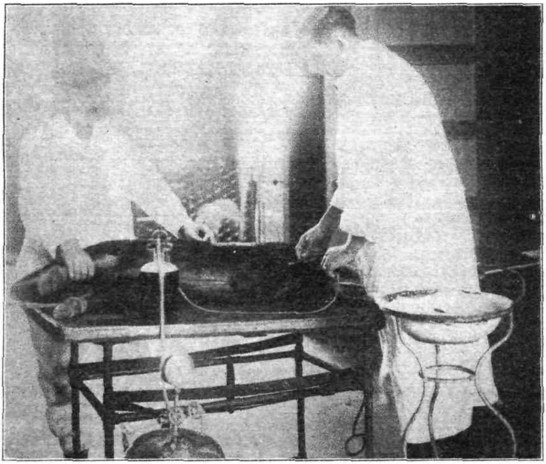

Figure 6. Injecting virus into an immune hog by the sub-cutaneous method to hyperimmunize.

producing "antibodies." The "antibodies" contained in the serum injected are soon thrown out of the circulatory system and the animal again becomes susceptible.

With the simultaneous method the dose of virus injected simultaneously with the serum will stimulate the body cells of the animal injected to produce more "antibodies." Therefore, animals that have been treated by the simultaneous method have a more permanent immunity to the disease than animals treated with serum alone on account of their blood containing more of these cholera resistant bodies.

PERIOD OF IMMUNITY.

The period of immunity varies greatly with the size and age of pigs and also with their environment. Generally, a safe period of immunity to estimate for pigs of different ages, when treated with serum alone or with serum and virus is shown in the following table:

Age of pig.	Approximate weight.	Length of immunity.	
		Serum alone method.	Simultaneous method.
3 days to 1 week	6 to 8 lbs.	2 weeks	4 weeks.
1 to 3 weeks	8 to 18 lbs.	4 weeks	6 to 8 weeks.
3 wks. to 8 wks	18 to 35 lbs.	5 to 7 weeks	2 to 4 mos.
8 wks. to 3 months	35 to 65 lbs.	7 to 8 weeks	5 to 6 mos.
3 months to 6 months	65 to 160 lbs.	8 to 10 weeks.	8 to 10 mos.
6 months to 12 months	160 to 250 lbs	8 to 12 weeks	About one year.
Over 12 months	250 and over	8 to 14 weeks.	1½ yrs., perhaps for life.

The above table is by no means strictly accurate. However, it is based on practical experience and may give an idea of what to expect of the serum in immunizing pigs. Of course the period of immunity *following the treatment varies greatly with different herds.* For instance, animals in infected pens when treated with serum alone may come in contact with the virus in some manner and thus develop immunity as lasting as would have been produced by the simultaneous method. *However, it would be poor policy to treat infected herds* with serum alone as explained later. There is great need for work along this line in order that a more definite idea of the period of immunity may be obtained.

DECIDING METHOD OF TREATMENT.

Field conditions must always be considered, individually, before deciding which method of treatment to use on any herd, and this should be done by a competent person who should also do the work. A competent veterinarian should be secured, if possible, to treat the first herd at least.

In small herds, where animals are bred and kept under sanitary conditions, unless cholera is present, the serum-alone method should be used. In using the simultaneous method the premises are actually inoculated with cholera even though every animal treated survives. As a consequence, untreated herds in the vicinity are in danger of cholera and the disease may be spread in this way. In this case the simultaneous method would also be very detrimental to the owner for it would mean that all pigs brought on the premises for sometime afterward, would have to be treated. While with the serum-alone method, protection from cholera during the dangerous period is obtained and the treating of animals does not have to be continued unless the disease is actually brought into the herd.

Brood sows should never be treated by the simultaneous method while pregnant. We have found that this will cause the sows to abort in a large percentage of cases or the pigs will be born weak

and apparently infected with cholera even though the sows remain healthy from treatment. However, pigs from sows having been treated by the simultaneous method previous to being bred, in some cases, possess immunity to cholera at birth and may remain immune for several weeks.

In herds of breeding stock, where cholera exists, it is more advisable to treat all animals in the herd, except pregnant brood sows and sick animals by the simultaneous method, since the healthy animals of the herd when treated with serum alone may wear off their immunity before coming in contact with the disease and come down with cholera. The brood sows in herds of this kind should be treated with serum alone, kept isolated from the herd and placed on uninfected ground until they farrow. After farrowing, both sows and pigs should be treated by the simultaneous method, or in case infection has diminished serum alone should be used. In infected herds, after treating the animals, the premises should be cleaned up and thoroughly disinfected. No animals should be sold except for immediate slaughter while cholera is on the premises and no animals should be placed in the herd without first being treated either by the serum alone or by the simultaneous method.

Where only herds of growing animals are kept and none of them used for breeding purposes, the simultaneous method should be used, since in continually bringing animals on the place from so many sources there is great danger, at all times, of bringing the disease to the place. Where garbage is fed to hogs there is danger of cholera being introduced by infected pork scraps. The safest plan for every owner of such a herd is to treat every animal by the simultaneous method. This will usually immunize them until ready for market. Such herds should be looked upon as dangerous by owners of susceptible hogs who are located in that vicinity, and all precautions should be taken to prevent the spread of disease. Owners of hogs on infected premises should be allowed to sell their hogs for slaughter only, under proper official supervision.

PREPARATION OF HERD FOR TREATMENT.

Having studied the condition of a herd of hogs and decided which method of treatment is to be used, the next step is to prepare the hogs for treatment. They should be placed in clean pens or houses and separated according to sizes, placing animals requiring the same dose in the same pen as near as possible. If some animals are sick, they should be removed from those remaining healthy and placed in an isolated place. No benefit can be expected from the treatment of sick animals. The hogs to be treated should be sprayed or dipped, if possible, with some good disinfectant and should by all means be clean. After treatment, they should not be allowed to run in mud or filthy places as this may produce some very unfavorable results.

TREATING THE HERD.

The operator or person who is to inject the serum and virus should have at hand the following equipment: 1 large hypodermic syringe, 30 cc. to 50 cc. capacity; 1 small hypodermic syringe, 5 to 10 cc. ca-

pacity; several good needles to fit syringes; a sterile dish for holding serum; a sterile dish for holding virus; a bottle of serum; a bottle of virus; a good disinfecting solution (5% solution of carbolic acid) for sterilizing needles and syringes; and a pail of disinfecting solution (3 to 5% carbolic acid solution or a 3% solution of compound solution of cresol, lysol, or any other equally good disinfectant) containing a cloth or brush for cleansing the place for inoculation. A

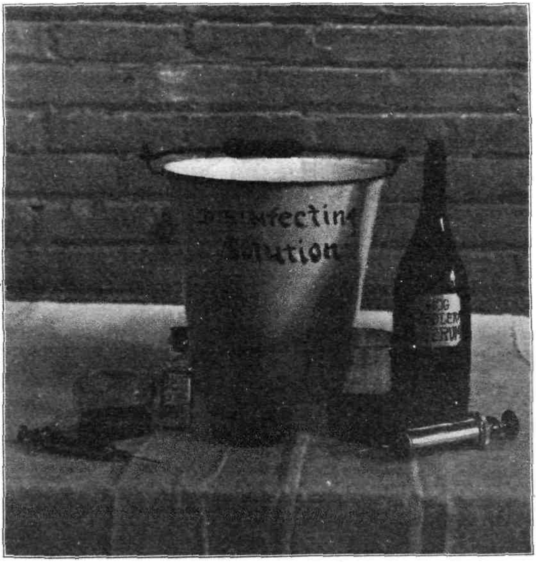

Figure 7. Equipment necessary for injecting hog cholera serum and virus.

small box placed where animals will not run over it may be used to support the syringes, etc.

Various methods of holding hogs for vaccination are employed, however some of these may be used to better advantage than others. Usually pigs weighing less than 100 pounds can be more easily treated by one man holding the hind legs of the animal upward with its back to his knees and thus exposing the fleshy parts of the hams to the operator so that he has a convenient place to make injections. The skin where injections are to be made should be thoroughly washed with the disinfecting solution before and after making injections. The

needle should be probed deeply into the muscle tissue and the serum or virus gradually forced in. In removing the needle the skin should be pinched tight around it and the wound sealed as near as possible with the finger after removing the needle to prevent leakage. In handling medium sized animals, they may be thrown on one side and held by the two upper feet by one man. In this position the injections may be made in the hams or just under the forelegs.

Holding heavy hogs for treatment is most easily accomplished by making a loop in a rope, placing it in the mouth and tightening it around the upper jaw. The animal may then be tied to a post and the injections made into the muscles of the neck. The serum and virus should *always* be injected in opposite places. If a practice is made of injecting the serum on the right side and the virus on the left, there is less chance of error.

The operator should not assist in catching or holding the hogs for treatment and should take all precautions known for cleanliness in administering the treatment. The serum and virus should be plainly labeled so as to prevent using serum for virus or virus for serum. A mistake of the operator might mean the loss of a whole herd of hogs.

The table of doses for administering hog cholera serum is as follows:

Weight of Pig.	Dose of serum.	Dose of virus.
Sucking pig	15 cc.	.2 cc.
30 to 50 lbs	20 cc.	.25 cc.
50 to 75 lbs	25 cc.	.5 cc.
75 to 100 lbs	30 cc.	.75 cc.
100 to 125 lbs	35 cc.	1. cc.
125 to 150 lbs	40 cc.	1.2 cc.
150 to 175 lbs	45 cc.	1.5 cc.
175 to 200 lbs	50 cc.	1.5 cc.
200 to 225 lbs	55 cc.	1.5 cc.
225 to 250 lbs	60 cc.	1.5 cc.
250 to 275 lbs	65 cc.	1.5 cc.
275 to 300 lbs	70 cc.	1.5 cc.
300 to 325 lbs	75 cc.	1.5 cc.
325 to 350 lbs	80 cc.	1.5 cc.
350 to 375 lbs	85 cc.	1.5 cc.
375 to 400 lbs	90 cc.	1.5 cc.
400 to 425 lbs	95 cc.	1.5 cc.
425 to 450 lbs	100 cc.	1.5 cc.
450 to 475 lbs	105 cc.	1.5 cc.
475 to 500 lbs	110 cc.	1.5 cc.
500 to 525 lbs	115 cc.	1.5 cc.
525 to 550 lbs	120 cc.	1.5 cc.
Over 550 lbs. add 5 cc. serum for every 25 lb. wt. Do not increase dose of virus.		

The same dose of serum is given with the serum-alone method as with the simultaneous method.

Serum and virus are prepared by the Bacteriological Laboratory of the Michigan Agricultural Experiment Station and distributed at as near the cost price as can be estimated. Since there is no appropriation for this work, it must be kept on a self supporting basis. The price of serum at present is 1½ cents per cubic centimeter and the price of virus is 1 cent per cubic centimeter.

The Bacteriological Laboratory recommends and encourages the use

Figure 8. Serum may be injected into muscles of neck of heavy hogs with ease.

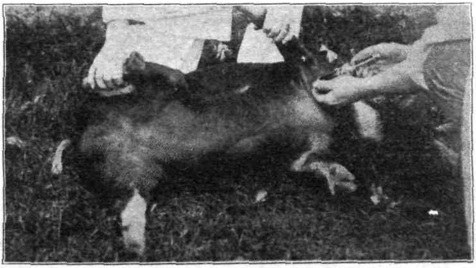

Figure 9. Injecting serum under fore leg.

of serum as a preventative of hog cholera only. However, no guarantee is made nor does the Laboratory or Experiment Station assume any responsibility for results following the use of serum, or serum and virus. This treatment acts as a preventative of cholera when used correctly but should not be used with the intention of preventing other diseases or disorders of swine. Each owner must act on his own judgment as to whether to use the serum or serum and virus on his herd. In any community where cholera exists, the most sane thing for swine owners to do is to treat their herds before they become infected, for once infected, it is a hard matter to handle the situation and it also means a loss of animals that could be saved if treated in time. The loss of one animal will usually be greater than the expense incurred by treating the whole herd. Farmers in any community should coöperate to stamp out this disease. One treated herd in the community does not protect the untreated herds and if this herd has had an outbreak or the simultaneous method of treatment has been employed, surrounding herds are endangered.

How to secure serum.—Hog cholera serum may be secured by any responsible person by wiring or writing to the Bacteriological Laboratory, at East Lansing, Michigan. Unless the charges accompany the order, serum is shipped by mail or express C. O. D. Care should be taken in calculating the amount of serum needed from the table of doses given above. Add a little extra for there is always a small loss in pouring the serum from bottles to a dish and then drawing it into the syringe. However, do not order more than needed as it cannot be returned to the Laboratory. If there is no table of doses at hand, give weight of hogs when ordering serum. Do not underestimate the weight of hogs for the sake of saving a few cents for there is no danger in giving too much serum but great danger in giving too little serum and too much virus.

CONTROL OF CHOLERA.

At present we have no practical method of controlling cholera. Hog cholera serum has saved many thousand dollars worth of hogs from cholera in this State and has in this way benefited individuals who had enough forethought to take advantage of this preventive. However, saving hogs for these individuals has proven detrimental to numerous other hog owners and thus instead of controlling the disease, the use of the simultaneous method of treating animals has aided its spread in some localities. So we can readily see that to control hog cholera with hog cholera serum we must treat every herd in a community where the disease exists, treating the infected herds by the simultaneous method and the cholera-free herds by the serum-alone method. We know that it is impossible to disinfect any premises where infected hogs are kept to such an extent as to remove all cholera infection, within any reasonable time. However, disinfection must be practiced as it is an aid in stamping out any infectious disease and will shorten the time for the disease to entirely disappear. It seems that the only sure way of freeing any premises of cholera is to remove hogs entirely, burn the hog houses and cultivate the lots for at least one year. However, this would be a rather expensive operation, especially where hogs are depended upon for a

Figure 10.
Treating Pig weighing less than 100 pounds

Figure 11. A convenient way of holding medium sized hogs. Injecting serum into muscles of ham.

good share of the profit on the farm. It would seem wiser to undertake to stamp out the disease without removing the hogs. To do this *means very difficult work. The animals on infected premises must* be treated by the simultaneous method for individual protection. Thus we are introducing cholera at every treatment. However, it seems reasonable that if the premises are properly disinfected after treating the herd by the simultaneous method and the hogs are thoroughly dipped or sprayed several times, the disease could be stamped out. In a case of this kind, new animals could be brought on the premises a *few weeks after the treatment and treated with serum alone.* I have known of some infected herds where the simultaneous method of treatment was used successfully, saving a large percentage of the herd and in the course of a few weeks new animals were introduced into the herd, not treated at all, and remained healthy.

In trying to control hog cholera with the aid of serum, the following suggestions may be helpful:

(1) *Never treat healthy herds by the simultaneous method, but with* serum alone, unless in immediate danger of cholera.

(2) Treat healthy animals in infected herds with simultaneous method and when the outbreak is apparently over, treat animals brought into the herd with serum alone until satisfied the disease is extinct. In herds where animals are fed garbage or slaughter house refuse, the simultaneous method must be continued and every animal treated for individual success. A thermometer should be used to distinguish sick hogs from healthy ones when treating any herd where the disease exists.

(3) Treat all herds within several miles of an infected herd with serum alone.

(4) Do not wait until the herd is infected before using serum.

(5) Do not condemn the serum when treated animals die as there is chance of error elsewhere.

(6) Learn to interpret results following use of serum and virus, so that you may know what to expect of the treatment.

Address all communications relative to hog cholera and serum, and other infectious diseases, to the Bacteriological Laboratory, East Lansing, Michigan.

NOTE: I wish to acknowledge my indebtedness to the members of the bacteriological laboratory for many suggestions which have been of great help to me in writing this bulletin. All Photographs are by Zae Northrop.—W. S. R.